JC05 Rec'd PCT/PTO 27 JUL 2001

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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: West.6268

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/890315

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/00419	20 January 2000	28 January 1999

TITLE OF INVENTION: LOCAL NETWORK IN A VEHICLE

APPLICANT(S) FOR DO/EO/US: Detlef Teichner

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   - a. [X] is attached hereto (required only if not communicated by the International Bureau).
   - b. [ ] has been communicated by the International Bureau.
   - c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   - a. [X] is attached hereto.
   - b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [X] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   - a. [X] are attached hereto (required only if not communicated by the International Bureau).
   - b. [ ] have been communicated by the International Bureau.
   - c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   - d. [ ] have not been made and will not be made.
8. [X] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [X] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [X] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information:
   - Copy of International Preliminary Examination Report in German
   - Certificate of Mailing
   - Proposed Drawing Amendmentand a redlined copy of the figure

09890315 ... 072701

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/890315	PCT/EP00/00419	West.6268

21. [X] The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**

				CALCULATIONS	PTO USE ONLY
ENTER APPROPRIATE BASIC FEE AMOUNT =				$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$ 130.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	20 - 20 =	0	x **$18.00**	$	
Independent claims	3 - 3 =	0	x **$80.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 990.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +				$	
SUBTOTAL =				$ 990.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 990.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$ 990.00	
				Amount to be refunded:	$
				charged:	$

a. [X] A check in the amount of $ 990.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. ____________ in the amount of $ __________ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0079 . A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Detlef Teichner

GROUP: Not yet assigned

INTERNATIONAL APPLN. NO.: PCT/EP00/00419

EXAMINER: Not yet assigned

SERIAL NO: Not yet assigned

INTERNATIONAL FILING DATE: 20 January 2000

FOR: LOCAL NETWORK IN A VEHICLE

FIRST PRELIMINARY AMENDMENT

Entry of this preliminary amendment is respectfully requested.

Table of Contents:

Preliminary to calculation of the filing fee, please amend the above-identified application as follows:

Marked-up copy of the specification

A LOCAL NETWORK IN A VEHICLE

BACKGROUND OF THE INVENTION

~~The~~ This invention relates generally to local networks in a vehicle and, more particularly, to efficiently transmitting data over a local network ~~for~~ in a vehicle with several network subscribers distributed over the vehicle~~, which are connected to one another by means of a data line to transmit audio and video data as well as control data, so as to form a ring network~~.

The implementation of a local network in a vehicle is well known. One conventional approach to using a ~~Such a~~ local network ~~for~~ in a vehicle is ~~known from~~ disclosed in ~~the~~ German Patent Specification DE 195 03 213 C1. Typically, such ~~This~~ local ~~network~~ networks have ~~has~~ several network nodes, referred to herein as subscribers. Some of the subscribers ~~, some of which~~ generate audio data, video data, and control data, and transmit the data over ~~feed these into~~ the ~~ring~~ network. ~~These~~ Such subscribers are referred to herein as ~~called~~ data sources. Other subscribers on ~~of~~ the network ~~take~~ receive data from the network ~~the data intended for them from the network~~ and reproduce the data. Such data reproduction can be, for example, ~~cause them to be displayed, which may be~~ an acoustic ~~reproduction~~ or ~~a~~ visual reproduction. These subscribers are referred to herein as ~~so-called~~ data sinks.

Such conventional vehicle-hosted ~~The~~ local networks ~~described here has~~ have various equipment that serve as data sources. Examples of such equipment include, for example, ~~, for example~~ a car radio, CD player, video recorder, ~~or also a~~ TV tuner, etc. Such devices ~~which~~ conduct their data uncompressed to appropriate data sinks via ~~an optical~~ a data line of the network. The data sinks can be, for example, an audio amplifier to which several loudspeakers are connected, or a display screen which displays an ~~the~~ uncompressed BAS video signal. Typically, the video and audio data are transmitted separately and concurrently.

For example, ~~Using~~ a TV tuner ~~as an example of a~~ data source transmits audio, video and control data over the local network. The ~~, the~~ video data are transmitted to a screen, in the manner described above, as uncompressed FBAS video signals. ~~; in~~ In parallel to this, the audio data are transmitted to an audio amplifier ~~via the network,~~ as uncompressed audio data~~,~~ and are reproduced as acoustic signals. Typically, the ~~The~~ audio and video data are ~~here~~ transmitted in a format ~~which~~ that prescribes a clocked sequence of individual bit groups of the same length. In these bit groups, specific bit positions for transmission from the data source to the data sink are prescribed for the audio and video data, together referred to as ~~that is~~ real-time-relevant source data. Real-time-relevant source data~~, which~~ are not accessible to an interruption of the data flow. Specific bit positions are also prescribed ~~, as well as~~ for the control data, if present. The bit positions for the source data are collected together in several connected partial picture groups, by means of which the specific audio and video data of a data source are transmitted in parallel to an associated data sink. This transmission is organized by ~~means of~~ control data that are transmitted in parallel with the audio and video data. The subscribers on ~~to~~ such a network can input their data into the network or take their data from it independently of one another and sometimes simultaneously. Such a network can accommodate only a few subscribers, since the transmission capacity of the network over the data line is limited.

What is needed, therefore, is a ~~It is the object of the invention to create a~~ local network for use in a vehicle that ~~which, on the one hand, better~~ substantially utilizes the maximum transmission capacity ~~with a view to possibly increasing the number of subscribers~~while maintaining ~~, but on the other hand maintains as much as possible~~ the quality of data display in the data sinks.

~~This object is achieved by the invention by a local network with the characteristics of Claim 1.~~

~~Advantageous developments are found in the subclaims.~~

SUMMARY OF THE INVENTION

Briefly, according to an aspect of the invention, a vehicle-hosted local network is disclosed. The network includes a subscriber data source that transmits in parallel audio data and compressed video data to respective subscriber data sinks on the network.

In another aspect of the invention, a method for pre-processing a compressed signal generated by equipment for transmitting audio and video data over a local network implemented in a vehicle is disclosed. The method includes separating compressed audio and compressed video data contained in the compressed signal and, parallel processing the compressed audio data and the compressed video data such that time differences in the reproduction of correlated audio data and video data are minimized.

In a further aspect of the invention, a local network in a vehicle with several subscribers distributed over the vehicle is disclosed. The subscribers form data sources and data sinks which are connected with one another a data line to transmit audio, video and control data. The audio, video, and control data are transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length, in which certain bit positions are provided respectively for the audio, video, and control data. The bit positions for the audio or video data respectively are collected together in several connected component bit groups, and the data assigned to these component bit groups are assigned by transmitted control signals to a certain data source or data sink. Included in the network is a data source for compressed audio and video that includes a demultiplexer to separate the compressed audio and compressed video data contained in one compressed signal, a bit stream decoder to decode the compressed audio data, an audio buffer for intermediately storing the separated audio data, a bit rate converter to recode the compressed video data, a video buffer for intermediately

storing the separated video data, a bus interface that inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and a control unit that is connected to the audio buffer and the video buffer, and which specifies and controls the adjustable intermediate storage time of the buffers.

These and other objects, features and advantages of the present invention will become apparent in light of the following detailed description of preferred embodiments thereof, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a block diagram of a subscriber data source for transmitting over a local network implemented in a vehicle in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a ~~The inventive~~ local network for use in a vehicle that includes ~~has~~ a subscriber data source that transmits ~~for~~ compressed audio and video data~~,~~. The subscriber data source includes equipment that generates a compressed source signal that includes audio, video and, possibly, other types of data. In addition, the subscriber data source includes a circuit that pre-processes separately and in parallel the compressed data components (audio, video, other) in the compressed source signal. ~~which~~ The circuit has a demultiplexer ~~to separate~~ that separates the compressed audio and compressed video data contained in ~~a~~ the compressed source signal. The~~se~~ separated compressed audio and video data are processed separately ~~from one another~~. The compressed audio data are ~~then~~ conducted to a bit stream decoder for decoding. The bit stream decoder converts the audio

data into an uncompressed format~~, especially~~ such as for example a PCM format. An audio buffer for the intermediate storage of the separated audio data is associated with the bit stream decoder. The intermediate storage time of this audio buffer can be varied by appropriate control instructions. The compressed video data, separated previously from the audio data by the demultiplexer~~off by the demultiplexer~~, are conducted for recoding to a bit rate converter, which accomplishes a data reduction of the video data. The scope of this reduction is ~~here guided especially~~ performed in accordance with the resolution and size of the display in the data sink. In this way, it becomes possible that the extent of the ~~transmitted~~ compressed video data that is transmitted across the network is markedly reduced. Since the extent of reduction is ~~matched to~~ based on the requirements of the data sink, the display quality of the video data is not adversely affected~~ thereby~~. A video buffer, whose intermediate storage time can be adjusted by a control instruction, is associated with this bit rate converter.

The intermediately stored, decoded audio data and the intermediately stored, recoded video data are conducted to a bus interface, which combines ~~brings~~ the data into ~~the~~ component picture ~~[sic, should be "bit", also ff]~~ groups ~~provided~~ for parallel transmission over the local network to ~~to the data sink, and thus makes possible parallel transmission to conduct these data over the data line to~~ their respective data sink. The intermediate storage time of the buffers is ~~here~~ controlled by a control unit in the ~~data source~~ pre-processing circuit in such a way that time differences in the ~~display~~ reproduction of the correlated audio data and video data ~~at least~~ are reduced ~~but~~ and, preferably, ~~are~~ completely eliminated. Such time differences can occur, for example, due to a different length of time required ~~for~~ to complete the processing operations performed in the bit stream decoder and in the bit rate converter. It is thus assured that the correct sound for a picture is transmitted at the proper time relative to the display~~and displayed at the correct time~~. It thus becomes possible to improve the quality of the ~~transmitted~~ data transmitted from the data source for both the audio and video data in a

mutually coordinated manner.

The specific design of the transmission of the data-reduced, compressed video data and the uncompressed audio data over the datea line additionally achieves an advantageous compromise between the requirements of economy of the local network and its optimized transmission capacity. According to an aspect of the invention, the audio data are transmitted in an uncompressed form, thus providing an economical design for the data sink for audio data.~~;~~ H~~h~~owever, in view of the very extensive quantities of video data, even in spite of data reduction, compressed transmission is chosen. As a result, ~~, and thus~~ the data sink for video data must be equipped with a corresponding~~ly expensive~~ decoder module. However, in view of the improved utilization of the data transmission capacity, this is compensated by the transmission of the compressed, reduced video signal.

In ~~There are data sources which, in~~ addition to the compressed audio data and video data, the data source equipment can also receive other compressed data or take such data from a data medium, such as, for example, a DVD (digital versatile disc) player. Such a DVD player ~~(digital versatile disc player)~~ can read, in its playback unit, the compressed signals stored on a DVD disc, and ~~by means of~~ a demultiplexer can divide these data into the components of compressed audio data, compressed video data, and compressed "other" data, and can conduct these to specific, separate ~~further~~ processing units. In the manner described, the compressed audio data and the compressed video data are put into intermediate storage and are decoded or recoded respectively, while the other compressed data are conducted to a second bit rate converter for recoding, and furthermore these data are conducted along the data path to a data buffer for intermediate storage of these separated data. After the various types of data have been separately processed, they are all conducted to a bus interface, which inserts the various data into appropriate, separate component picture groups for transmission, via the data line, to their respective data sink. The data buffer is controlled by the control unit in

correspondence with the audio buffer and ~~to~~ the video buffer, and the variable intermediate storage time is thus specified. By ~~suitably~~ specifying the intermediate storage time of the respective buffers, the time differences in the display of the data, which have resulted for the compressed audio, video, and other data along their path from the antenna or from the storage medium or from a feed line from the data source are at least partly compensated. Typical examples of other compressed data are information regarding the so-called subpictures, as these are known from the DVD. Through this triple division of the compressed signals, it is assured that all the various data are delayed in their time progress specifically and differently, for example in accordance with the respective processing time, so that the audio data, video data, and other data are displayed as simultaneously as possible, for example as subpictures in the individual data sinks.

It has proven advantageous to situate the buffers directly before the interface, that is after the bit rate converter or decoder. This assures that all time differences generated before the intermediate storage, especially the time differences formed in the decoder and the bit rate converters, are at least partly compensated before the data are inserted into the component picture groups through the bus interface. This control is designed as a type of forward control, resulting in a very simple, secure, and economical controlled structure.

In addition, it is also possible to situate the buffers directly behind the demultiplexer and before the respectively associated bit stream decoder or bit rate converter. This assures that the various data can be transmitted completely or largely time-corrected already while the compressed data are further processed in the bit rate converter or the audio decoder. This design proves to be especially advantageous if the control unit controls not only the buffers but also the bit rate converters and the audio decoder in such a way that these are enabled to perform a possibly needed slight compensation of~~3~~ existing time differences. Such a compensation can be effected, for example in the case of data from a DVD player, by means

of the so-called time stamps associated with the data.

According to a preferred ~~design~~ embodiment of the invention, analytical units are situated in the pre-processing paths for ~~processing~~ the audio data, the video data, and the other data. ~~By means of these,~~ These units provide the respective present relative delays resulting from the different processing or modification of the data in their individual paths, ~~is observed~~ and~~,~~ interacting with the control unit~~,~~ the delay times in the individual buffers or in the bit rate converters or the bit stream decoders are set in accordance with the presently observed conditions. This makes it possible to react specifically to the most various situations. For example, if no sound or only a stationary picture or only simple numeric characters are being transmitted, the data quantities to be processed and transmitted change, so that different processing times for one and the same data type can occur. These changes are taken into account through the present design of the invention.

It has proven especially advantageous to design the network with an optical data line. With this design, the maximum data quantity that can be transmitted by the network is nearly independent of the theoretically maximum transmission capacity of the data line, since this capacity typically cannot be exhausted by a local network for an automotive application. Consequently, the limited data transmission capacity of the data line need not be taken into account.

The bit rate converter for the compressed video data preferably is connected to the control unit, and can be controlled in such a way that the scope of data reduction during the bit rate conversion can be adjusted ~~in dependence~~ based on the quantity of data ~~quantity~~ that can be displayed by the data sink.

As the scope of data reduction varies, the processing time ~~needed~~ for ~~this in~~ the bit rate converter to perform the operations also varies. Depending ~~, so that, depending~~ on the resolution and/or the size of the display in the data sink and, thus, ~~depending on~~ the display

capabilities of the display, the required delay time of the individual data types is chosen accordingly~~, by the inventive design~~. The transmission of the relevant information about the display in the data sink to the control unit via the ~~ring~~ local network data line enables the control unit to control the bit rate converter for the video data and/or the corresponding delay elements in such a way that the various data are displayed without significant time discrepancy.

According to ~~an especially preferred design~~ one embodiment of the invention, at least one data sink for the data transmitted from the data source via the data line is equipped with a buffer for intermediate storage of the received data. The intermediate storage time of this buffer depends on a control signal that is transmitted from the data source via the local network data line. Thus, the time progress of the data can be corrected not only in the data source but also in the data sink. In this way, it is possible to correct systematic delays for data associated with a particular data sink by means of a buffer situated in this data sink. A correction in the data source or in another data sink is thus not necessary. Accordingly, systematic differences in the data sources can be corrected by such a buffer in the respective data sink.

A block diagram of an ~~preferred~~ embodiment of the inventive data source is shown in the Figure ~~1~~. ~~and will be~~ explained in more detail below. The local network has a plurality of subscribers ~~which are~~ connected ~~in a ring~~ to each other over an optical data line 1 to form a ring network. Each subscriber has a bus interface 2 with two connections to ~~the~~ optical data line 1. The subscriber ~~shown in Figure 1~~ represents a data source, and is referred to herein as subscriber data source 100. Subscriber data source 100 includes ~~which has~~, in this exemplary embodiment, a DVD drive 3 ~~and which~~ that ~~prepares~~ generates a ~~the~~ compressed signal 22. The compressed signal 22 includes ~~some~~ a combination of audio data, video data, and other data stored on a DVD disc. The compressed audio, video and other data components are

processed separately and provided to ~~and feeds these, through~~ ~~the~~ bus interface 2 ~~, into the data line 1,~~ for transmission to the appropriate ~~the~~ data sinks that are associated with ~~this~~ subscriber data source 100. The compressed audio, video, and other data, which have been read out from ~~the~~ DVD drive 3~~, and which~~ are presented as a compressed source signal 24.~~,~~ These components of compressed source signal 24 are separated out of ~~the~~ common compressed signal 24 in a demultiplexer 4 of pre-processing circuit 20. Each type of data is ~~, and each of them is~~ conducted to a specific processing path in circuitry 20 for separate, coordinated processing.

~~The c~~Compressed video data 15, separated off by ~~the~~ demultiplexer 4, are conducted to a well-known ~~an~~ analytical unit 5A configured to analyze ~~for~~ video data as a multiple video packet-sized elementary stream. Analytical unit 5A ~~This unit~~ analyzes the extent and type of compressed video data 15 to be processed, and conducts the result of this analysis to ~~the~~ a control unit 6. As one of ordinary skill in the art would find apparent, the ~~The analyzed,~~ compressed video data~~,~~ are not changed by ~~the~~ analytical unit 5A.~~,~~ Once analyzed, the compressed video data ~~and subsequently~~ are conducted to a bit rate converter 10~~, which~~ that recodes the compressed video data from the source of the compressed signal, here, the ~~the~~ DVD disc. In one application, the compressed video ~~These~~ data are formatted in accordance with ~~follow~~ the MPEG-2 video standard and have variable bit rates up to 10 megabit/s. During the recoding, a data reduction occurs, which is guided in accordance with the properties of the data sink and, in particular, ~~according~~ to the size and resolution of the display in the data sink. The information regarding the size and resolution is conducted to ~~the~~ control unit 6 via a ~~the data line 1, the bus interface 2, and the~~ control line 13, and ~~are~~ is converted into appropriate control instructions to control the bit rate converter 10. Since the MPEG-2 video data are designed for display on a large high-resolution screen, and since such high-resolution large screens find no application in a vehicle, the data reduction described above

can discard the majority of the compressed video data by as much as ~~three-quarters~~75%, with the remaining video data being transmitted to the appropriate data sink. ~~and only the rest will be transmitted.~~ It should be noted that this reduction in video data ~~This~~ does not noticeably affect the display of the video data in the data sink. The recoded, data-reduced, compressed video data are then conducted to ~~the~~ a video buffer 7 as packet-sized elementary streams. Under the control of ~~the~~ control unit 6, ~~this~~ video buffer 7 can change the intermediate storage time and thus the delay time. The delayed video data are then conducted to ~~a~~ bus interface 2. The bus interface 2 ~~, which~~ writes the video data into appropriate component picture ~~[sic]~~ groups~~,~~ for transmission to a corresponding data sink.

Pre-processing circuitry 20 processes compressed audio data in a manner similar to ~~Besides~~ the compressed video data. The ~~, the~~ compressed audio data are conducted from the demultiplexer 4 to a corresponding audio data path 16, which is constructed separately from ~~the~~ compressed video data path 15. The compressed audio data, like the video data, are conducted to an analytical unit 5B, which investigates the extent and type of the audio data. The analytical unit 5B ~~, and~~ conducts the result of its analysis operations to ~~the~~ control unit 6. ~~Then t~~The unchanged, compressed audio data, which are present in a DVD disk, for example in accordance with the Dolby digital compression process, are decoded by a bit stream decoder 11. ~~This~~ The bit stream decoder 11 is preferably constructed as a Dolby digital decoder 11, and converts the compressed audio signals into uncompressed PCM signals, which make possible Surround Sound (5 + 1 channels). The uncompressed audio data are then conducted to an audio buffer 8. Audio buffer 8 ~~, which~~ is connected to ~~the control unit 5~~ and ~~which~~ can be controlled by ~~this~~ control unit 6 in such a way that the intermediate storage time~~,~~ and thus the delay time, of the uncompressed audio data can be changed.

In corresponding fashion, the compressed~~,~~ "other" data, which were previously separated by ~~the~~ demultiplexer 4 from the other data components in compressed source signal

24, are assigned to a data path that is separate that the video and audio data paths through circuit 20. This data path ~~, which~~ correspondingly has an analytical unit 5, another bit rate converter 12, and a data buffer 9. The~~se~~ components of the data path have the corresponding functionalities as the components of the other paths.

From the three analytical units 5A-5C, the control unit 6 obtains information regarding the expected relative time delays resulting from the different processing times in the individual data paths. Based on ~~By means of~~ this information, the respective delay times of the individual buffers 7, 8, 9 are chosen. Also, the bit rate converter 10 for the compressed video data and the Dolby digital decoder 11 for the compressed audio data, as well as the other bit rate converter 12 for the compressed other data are driven by ~~the~~ control unit 6 in such a way that their processing occurs slightly later or earlier. A time correction is also performed ~~here~~ by ~~means of~~ the time stamps contained in the compressed data. The time stamps themselves can ~~here~~ also be read out from the bit stream, ~~can be~~ changed, and can again be inserted into the bit stream for a subsequent correction.

This inventive separation of the various data components and their concurrent yet specific processing, including the specific delay times dependent thereon, more closely harmonize the mutually correlated data. These are then transmitted via ~~the~~ bus interface 2 to ~~the~~ data line 1, and to the respective data sinks, that is other subscribers of the network, which are accommodated separately from the data source at another place in the vehicle. The inventive design with the correction of the time differences due to the different processing times of the various data types succeeds in displaying the correlated data largely or completely synchronously. This ~~assures~~ ensures that a tone reproduced by a sound system matches a picture reproduced on a display in the motor vehicle. This raises the level of the visual and acoustic reproduction quality of the local network with its subscribers. Furthermore, the transmission capacity of the network is used very efficiently, since, depending on the data

type, compressed, data-reduced transmission forms and uncompressed data forms are transmitted simultaneously.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

~~List of Reference Symbols~~

~~1 Data line~~
~~2 Bus interface~~
~~3 DVD drive~~
~~4 Demultiplexer~~
~~5 Analytical unit~~
~~6 Control unit~~
~~7 Video buffer~~
~~8 Audio buffer~~
~~9 Data buffer~~
~~10 Bit rate converter~~
~~11 Dolby digital decoder~~
~~12 Second bit rate converter~~
~~13 Control line~~

Clean Copy of the Specification
Following Entry of this Amendment

A LOCAL NETWORK IN A VEHICLE

BACKGROUND OF THE INVENTION

This invention relates generally to local networks in a vehicle and, more particularly, to efficiently transmitting data over a local network in a vehicle with several network subscribers distributed over the vehicle.

The implementation of a local network in a vehicle is well known. One conventional approach to using a local network in a vehicle is disclosed in German Patent Specification DE 195 03 213 C1. Typically, such local networks have several network nodes, referred to herein as subscribers. Some of the subscribers generate audio data, video data, and control data, and transmit the data over the network. Such subscribers are referred to herein as data sources. Other subscribers on the network receive data from the network and reproduce the data. Such data reproduction can be, for example, an acoustic or visual reproduction. These subscribers are referred to herein as data sinks.

Such conventional vehicle-hosted local networks have various equipment that serve as data sources. Examples of such equipment include, for example, a car radio, CD player, video recorder, TV tuner, etc. Such devices conduct their data uncompressed to appropriate data sinks via a data line of the network. The data sinks can be, for example, an audio amplifier to which several loudspeakers are connected, or a display screen which displays an uncompressed BAS video signal. Typically, the video and audio data are transmitted separately and concurrently. For example, a TV tuner data source transmits audio, video and control data over the local network. The video data are transmitted to a screen, in the manner described above, as uncompressed FBAS video signals. In parallel to this, the audio data are transmitted to an audio amplifier as uncompressed audio data and are reproduced as acoustic signals. Typically, the audio and video data are transmitted in a format that prescribes a

clocked sequence of individual bit groups of the same length. In these bit groups, specific bit positions for transmission from the data source to the data sink are prescribed for the audio and video data, together referred to as real-time-relevant source data. Real-time-relevant source data are not accessible to an interruption of the data flow. Specific bit positions are also prescribed for the control data, if present. The bit positions for the source data are collected together in several connected partial picture groups, by means of which the specific audio and video data of a data source are transmitted in parallel to an associated data sink. This transmission is organized by control data that are transmitted in parallel with the audio and video data. The subscribers on such a network can input their data into the network or take their data from it independently of one another and sometimes simultaneously. Such a network can accommodate only a few subscribers, since the transmission capacity of the network over the data line is limited.

What is needed, therefore, is a local network for use in a vehicle that substantially utilizes the maximum transmission capacity while maintaining the quality of data display in the data sinks.

SUMMARY OF THE INVENTION

Briefly, according to an aspect of the invention, a vehicle-hosted local network is disclosed. The network includes a subscriber data source that transmits in parallel audio data and compressed video data to respective subscriber data sinks on the network.

In another aspect of the invention, a method for pre-processing a compressed signal generated by equipment for transmitting audio and video data over a local network implemented in a vehicle is disclosed. The method includes separating compressed audio and compressed video data contained in the compressed signal, and parallel processing the compressed audio data and the compressed video data such that time differences in the

reproduction of correlated audio data and video data are minimized.

In a further aspect of the invention, a local network in a vehicle with several subscribers distributed over the vehicle is disclosed. The subscribers form data sources and data sinks which are connected with one another by a data line to transmit audio, video and control data. The audio, video, and control data are transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length, in which certain bit positions are provided respectively for the audio, video, and control data. The bit positions for the audio or video data respectively are collected together in several connected component bit groups, and the data assigned to these component bit groups are assigned by transmitted control signals to a certain data source or data sink. Included in the network is a data source for compressed audio and video that includes a demultiplexer to separate the compressed audio and compressed video data contained in one compressed signal, a bit stream decoder to decode the compressed audio data, an audio buffer for intermediately storing the separated audio data, a bit rate converter to recode the compressed video data, a video buffer for intermediately storing the separated video data, a bus interface that inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and a control unit that is connected to the audio buffer and the video buffer, and which specifies and controls the adjustable intermediate storage time of the buffers.

These and other objects, features and advantages of the present invention will become apparent in light of the following detailed description of preferred embodiments thereof, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a block diagram of a subscriber data source for transmitting over a local

network implemented in a vehicle in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a local network for use in a vehicle that includes a subscriber data source that transmits compressed audio and video data. The subscriber data source includes equipment that generates a compressed source signal that includes audio, video and, possibly, other types of data. In addition, the subscriber data source includes a circuit that pre-processes separately and in parallel the compressed data components (audio, video, other) in the compressed source signal. The circuit has a demultiplexer that separates the compressed audio and compressed video data contained in the compressed source signal. The separated compressed audio and video data are processed separately. The compressed audio data are conducted to a bit stream decoder for decoding. The bit stream decoder converts the audio data into an uncompressed format such as for example a PCM format. An audio buffer for the intermediate storage of the separated audio data is associated with the bit stream decoder. The intermediate storage time of this audio buffer can be varied by appropriate control instructions. The compressed video data, separated previously from the audio data by the demultiplexer, are conducted for recoding to a bit rate converter, which accomplishes a data reduction of the video data. The scope of this reduction is performed in accordance with the resolution and size of the display in the data sink. In this way, it becomes possible that the extent of the compressed video data that is transmitted across the network is markedly reduced. Since the extent of reduction is based on the requirements of the data sink, the display quality of the video data is not adversely affected. A video buffer, whose intermediate storage time can be adjusted by a control instruction, is associated with this bit rate converter.

The intermediately stored, decoded audio data and the intermediately stored, recoded video data are conducted to a bus interface, which combines the data into component picture groups for parallel transmission over the local network to their respective data sink. The intermediate storage time of the buffers is controlled by a control unit in the pre-processing circuit in such a way that time differences in the reproduction of the correlated audio data and video data are reduced and, preferably, completely eliminated. Such time differences can occur, for example, due to a different length of time required to complete the processing operations performed in the bit stream decoder and in the bit rate converter. It is thus assured that the correct sound for a picture is transmitted at the proper time relative to the display. It thus becomes possible to improve the quality of the data transmitted from the data source for both the audio and video data in a mutually coordinated manner.

The specific design of the transmission of the data-reduced, compressed video data and the uncompressed audio data over the data line additionally achieves an advantageous compromise between the requirements of economy of the local network and its optimized transmission capacity. According to an aspect of the invention, the audio data are transmitted in an uncompressed form, thus providing an economical design for the data sink for audio data. However, in view of the very extensive quantities of video data, even in spite of data reduction, compressed transmission is chosen. As a result, the data sink for video data must be equipped with a corresponding decoder module. However, in view of the improved utilization of the data transmission capacity, this is compensated by the transmission of the compressed, reduced video signal.

In addition to the compressed audio data and video data, the data source equipment can also receive other compressed data or take such data from a data medium, such as, for example, a DVD (digital versatile disc) player. Such a DVD player can read, in its playback unit, the compressed signals stored on a DVD disc, and by a demultiplexer can divide these

data into the components of compressed audio data, compressed video data, and compressed "other" data, and can conduct these to specific, separate processing units. In the manner described, the compressed audio data and the compressed video data are put into intermediate storage and are decoded or recoded respectively, while the other compressed data are conducted to a second bit rate converter for recoding, and furthermore these data are conducted along the data path to a data buffer for intermediate storage of these separated data. After the various types of data have been separately processed, they are all conducted to a bus interface, which inserts the various data into appropriate, separate component picture groups for transmission, via the data line, to their respective data sink. The data buffer is controlled by the control unit in correspondence with the audio buffer and the video buffer, and the variable intermediate storage time is thus specified. By specifying the intermediate storage time of the respective buffers, the time differences in the display of the data, which have resulted for the compressed audio, video, and other data along their path from the antenna or from the storage medium or from a feed line from the data source are at least partly compensated. Typical examples of other compressed data are information regarding the so-called subpictures, as these are known from the DVD. Through this triple division of the compressed signals, it is assured that all the various data are delayed in their time progress specifically and differently, for example in accordance with the respective processing time, so that the audio data, video data, and other data are displayed as simultaneously as possible, for example as subpictures in the individual data sinks.

It has proven advantageous to situate the buffers directly before the interface, that is after the bit rate converter or decoder. This assures that all time differences generated before the intermediate storage, especially the time differences formed in the decoder and the bit rate converters are at least partly compensated before the data are inserted into the component picture groups through the bus interface. This control is designed as a type of forward control,

resulting in a very simple, secure, and economical controlled structure.

In addition, it is also possible to situate the buffers directly behind the demultiplexer and before the respectively associated bit stream decoder or bit rate converter. This assures that the various data can be transmitted completely or largely time-corrected already while the compressed data are further processed in the bit rate converter or the audio decoder. This design proves to be especially advantageous if the control unit controls not only the buffers but also the bit rate converters and the audio decoder in such a way that these are enabled to perform a possibly needed slight compensation of existing time differences. Such a compensation can be effected, for example in the case of data from a DVD player, by means of the so-called time stamps associated with the data.

According to a preferred embodiment of the invention, analytical units are situated in the pre-processing paths for the audio data, the video data, and the other data. These units provide the respective present relative delays resulting from the different processing or modification of the data in their individual paths, and interacting with the control unit the delay times in the individual buffers or in the bit rate converters or the bit stream decoders are set in accordance with the presently observed conditions. This makes it possible to react specifically to the most various situations. For example, if no sound or only a stationary picture or only simple numeric characters are being transmitted, the data quantities to be processed and transmitted change, so that different processing times for one and the same data type can occur. These changes are taken into account through the present design of the invention.

It has proven especially advantageous to design the network with an optical data line. With this design, the maximum data quantity that can be transmitted by the network is nearly independent of the theoretically maximum transmission capacity of the data line, since this capacity typically cannot be exhausted by a local network for an automotive application.

Consequently, the limited data transmission capacity of the data line need not be taken into account.

The bit rate converter for the compressed video data preferably is connected to the control unit, and can be controlled in such a way that the scope of data reduction during the bit rate conversion can be adjusted based on the quantity of data that can be displayed by the data sink.

As the scope of data reduction varies, the processing time for the bit rate converter to perform the operations also varies. Depending on the resolution and/or the size of the display in the data sink and, thus, the display capabilities of the display, the required delay time of the individual data types is chosen accordingly. The transmission of the relevant information about the display in the data sink to the control unit via the local network data line enables the control unit to control the bit rate converter for the video data and/or the corresponding delay elements in such a way that the various data are displayed without significant time discrepancy.

According to one embodiment of the invention, at least one data sink for the data transmitted from the data source via the data line is equipped with a buffer for intermediate storage of the received data. The intermediate storage time of this buffer depends on a control signal that is transmitted from the data source via the local network data line. Thus, the time progress of the data can be corrected not only in the data source but also in the data sink. In this way, it is possible to correct systematic delays for data associated with a particular data sink by means of a buffer situated in this data sink. A correction in the data source or in another data sink is thus not necessary. Accordingly, systematic differences in the data sources can be corrected by such a buffer in the respective data sink.

A block diagram of an embodiment of the inventive data source is shown in the Figure. The local network has a plurality of subscribers connected to each other over an

optical data line 1 to form a ring network. Each subscriber has a bus interface 2 with two connections to optical data line 1. The subscriber represents a data source, and is referred to herein as subscriber data source 100. Subscriber data source 100 includes , in this exemplary embodiment, a DVD drive 3 that generates a compressed signal 22. The compressed signal 22 includes a combination of audio data, video data, and other data stored on a DVD disc. The compressed audio, video and other data components are processed separately and provided to bus interface 2 for transmission to the appropriate data sinks that are associated with subscriber data source 100. The compressed audio, video, and other data, which have been read out from DVD drive 3 are presented as a compressed source signal 24. These components of compressed source signal 24 are separated out of common compressed signal 24 in a demultiplexer 4 of pre-processing circuit 20. Each type of data is conducted to a specific processing path in circuitry 20 for separate, coordinated processing.

Compressed video data 15, separated off by demultiplexer 4, are conducted to a well-known analytical unit 5A configured to analyze video data as a multiple video packet-sized elementary stream. Analytical unit 5A analyzes the extent and type of compressed video data 15 to be processed, and conducts the result of this analysis to a control unit 6. As one of ordinary skill in the art would find apparent, the compressed video data are not changed by analytical unit 5A. Once analyzed, the compressed video data are conducted to a bit rate converter 10 that recodes the compressed video data from the source of the compressed signal, here, the DVD disc. In one application, the compressed video data are formatted in accordance with the MPEG-2 video standard and have variable bit rates up to 10 megabit/s. During the recoding, a data reduction occurs, which is guided in accordance with the properties of the data sink and, in particular, to the size and resolution of the display in the data sink. The information regarding the size and resolution is conducted to control unit 6 via a control line 13, and is converted into appropriate control instructions to control the bit rate

converter 10. Since the MPEG-2 video data are designed for display on a large high-resolution screen, and since such high-resolution large screens find no application in a vehicle, the data reduction described above can discard the majority of the compressed video data by as much as 75%, with the remaining video data being transmitted to the appropriate data sink. It should be noted that this reduction in video data does not noticeably affect the display of the video data in the data sink. The recoded, data-reduced, compressed video data are then conducted to a video buffer 7 as packet-sized elementary streams. Under the control of control unit 6, the video buffer 7 can change the intermediate storage time and thus the delay time. The delayed video data are then conducted to bus interface 2. The bus interface 2 writes the video data into appropriate component picture groups for transmission to a corresponding data sink.

Pre-processing circuitry 20 processes compressed audio data in a manner similar to the compressed video data. The compressed audio data are conducted from the demultiplexer 4 to a corresponding audio data path 16, which is constructed separately from compressed video data path 15. The compressed audio data, like the video data, are conducted to an analytical unit 5B, which investigates the extent and type of the audio data. The analytical unit 5B conducts the result of its analysis operations to control unit 6. The unchanged, compressed audio data, which are present in a DVD disk, for example in accordance with the Dolby digital compression process, are decoded by a bit stream decoder 11. The bit stream decoder 11 is preferably constructed as a Dolby digital decoder 11, and converts the compressed audio signals into uncompressed PCM signals, which make possible Surround Sound (5 + 1 channels). The uncompressed audio data are then conducted to an audio buffer 8. Audio buffer 8 is connected to and can be controlled by control unit 6 in such a way that the intermediate storage time, and thus the delay time, of the uncompressed audio data can be changed.

In corresponding fashion, the compressed "other" data, which were previously separated by demultiplexer 4 from the other data components in compressed source signal 24, are assigned to a data path that is separate that the video and audio data paths through circuit 20. This data path correspondingly has an analytical unit 5, another bit rate converter 12, and a data buffer 9. The components of the data path have the corresponding functionalities as the components of the other paths.

From the three analytical units 5A-5C, the control unit 6 obtains information regarding the expected relative time delays resulting from the different processing times in the individual data paths. Based on this information, the respective delay times of the individual buffers 7, 8, 9 are chosen. Also, the bit rate converter 10 for the compressed video data and the Dolby digital decoder 11 for the compressed audio data, as well as the other bit rate converter 12 for the compressed other data are driven by control unit 6 in such a way that their processing occurs slightly later or earlier. A time correction is also performed by the time stamps contained in the compressed data. The time stamps themselves can also be read out from the bit stream, changed, and can again be inserted into the bit stream for a subsequent correction.

This inventive separation of the various data components and their concurrent yet specific processing, including the specific delay times dependent thereon, more closely harmonize the mutually correlated data. These are then transmitted via bus interface 2 to data line 1, and to the respective data sinks, that is other subscribers of the network, which are accommodated separately from the data source at another place in the vehicle. The inventive design with the correction of the time differences due to the different processing times of the various data types succeeds in displaying the correlated data largely or completely synchronously. This ensures that a tone reproduced by a sound system matches a picture reproduced on a display in the motor vehicle. This raises the level of the visual and acoustic

reproduction quality of the local network with its subscribers. Furthermore, the transmission capacity of the network is used very efficiently, since, depending on the data type, compressed, data-reduced transmission forms and uncompressed data forms are transmitted simultaneously.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

Clean Copy of the Claims
Following Entry of This Amendment

1. A local network in a vehicle with several subscribers distributed over the vehicle, which form data sources and data sinks and which are connected with one another by a data line to transmit audio, video and control data, such that the audio, video, and control data are transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length, in which certain bit positions are provided respectively for the audio, video, and control data, and the bit positions for the audio or video data respectively are collected together in several connected component bit groups, and the data assigned to these component bit groups are assigned by transmitted control signals to a certain data source or data sink, at least one data source being present for audio and video data and at least one data sink being present for the audio and video data transmitted over the data line, wherein the at least one data source comprises:

a data source for compressed audio and video data including,

a demultiplexer to separate the compressed audio and compressed video data contained in one compressed signal,

a bit stream decoder to decode the compressed audio data,

an audio buffer for intermediately storing the separated audio data,

a bit rate converter to recode the compressed video data,

a video buffer for intermediately storing the separated video data,

a bus interface that inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and

a control unit that is connected to the audio buffer and the video buffer, and which specifies and controls the adjustable intermediate storage time of the buffers.

2. The local network of claim 1, wherein

the data source for compressed audio and video data is a data source for other compressed data, wherein the demultiplexer separates the other compressed data from the audio data and the video data, and wherein the data source further comprises

a second bit rate converter for recoding the other, compressed data, and

a data buffer for the intermediate storage of the separated other data, and wherein bus interface is configured to insert the delayed, decoded audio data, the delayed, recoded video data, and the delayed, recoded other data into their intended component bit groups.

3. The local network of claim 1, wherein the at least one of the buffers is situated before the bus interface.

4. The local network of claim 2, wherein the at least one buffer is operationally interposed between the demultiplexer and the bit stream decoder or bit rate converter associated with it.

5. The local network of claim 12, wherein analytical units are associated with the bit stream decoder and the bit rate converters, which determine the time relation of the compressed video data with respect to the compressed audio data, and which are connected to the control unit to specify the intermediate storage times.

6. The local network of claim 12, wherein the control unit controls the bit stream decoder and the bit rate converter, such that the time differences due to different processing times in the data source can be reduced in the displayed signals.

7. The local network of claim 1, wherein the data line is an optical data line.

8. The local network of claim 12, wherein the bit rate converter for the compressed video data is connected to the control unit, and can be controlled over this connecting line in such a way that the extent of data reduction during the bit rate conversion and thus the processing time needed for this can be adjusted in dependence on the resolution and/or the size of the display in the associated data sink for video data.

9. The local network of claim 2, wherein the bit stream decoder converts the compressed audio signal into a PCM audio signal.

10. The local network of claim 1, wherein the data source comprises a DVD player.

11. The local network of claim 1, wherein at least one data sink for the data transmitted from the data source via the data line comprises a buffer for the intermediate storage of the received data, whose intermediate storage time can be adjusted as a function of a control signal transmitted from the data source via the data line.

12. The local network of claim 2, wherein the data source further comprises:

a control unit, connected to the audio buffer, the video buffer, and the other data buffer, that specifies and controls the adjustable intermediate storage time of the buffers.

13. A vehicle-hosted local network comprising a subscriber data source that transmits in

parallel audio data and compressed video data to respective subscriber data sinks on the network.

14. The vehicle-hosted local network of claim 13, wherein the subscriber data source comprises:

a device that generates a compressed source signal including compressed audio data and compressed video data; and

a pre-processing circuit configured to parallel process the compressed audio data and the compressed video data.

15. The vehicle-hosted local network of claim 13, wherein the pre-processing circuit comprises:

a demultiplexer that separates the compressed audio data and the compressed video data contained in the compressed source signal;

an audio data processing path that decodes the compressed audio data into an uncompressed format and generates decoded audio data in response to control instructions;

a video data processing path that recodes the compressed video data to reduce the quantity of video data, and generates recoded video data in response to control instructions; and

a bus interface that combines the decoded audio data and the recoded video data into component picture groups for parallel transmission over the local network to their respective data sinks.

16. The vehicle-hosted local network of claim 15, wherein the audio data processing path

comprises:

a bit stream decoder for decoding the separated compressed audio data, converting the audio data into an uncompressed format; and

an audio buffer for storing the separated audio data for an intermediate time determined by the control instruction.

17. The vehicle-hosted local network of claim 15, wherein the video data processing path comprises:

a bit rate converter for recoding the compressed video data to reduce the quantity of video data; and

a video buffer for storing the separated video data for a time determined by the control instruction.

18. The vehicle-hosted local network of claim 13, wherein the subscriber data source comprises:

a device that generates a compressed source signal including compressed audio data and compressed video data; and

a pre-processing circuit configured to separately process the compressed audio data and the compressed video data to generate uncompressed audio data and a reduced quantity compressed video data, wherein time differences in the separate processing of correlated audio data and video data is minimized.

19. A method for pre-processing a compressed signal generated by equipment for transmitting audio and video data over a local network implemented in a vehicle, the method

comprising the steps of:

a) separating compressed audio and compressed video data contained in the compressed signal; and

b) parallel processing the compressed audio data and the compressed video data such that time differences in the reproduction of correlated audio data and video data are minimized.

20. The method of claim 19, wherein said step of parallel processing comprises the steps of:

decoding the compressed audio data into an uncompressed format;

recoding the compressed video data to reduce the quantity of video data; and

combining the decoded audio data and the recoded video data into component picture groups for parallel transmission over the local network to their respective data sinks.

REMARKS

Claims 1-11 have been amended. Claims 12-20 have been added. Claims 1-20 remain.

Examination on the merits is respectfully requested.

If a telephone interview could assist in the prosecution of this application, please call the undersigned attorney.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. A local network in a vehicle with several subscribers distributed over the vehicle, which form data sources and data sinks and which are connected with one another by ~~means of~~ a data line ~~(1)~~ to transmit audio, ~~and~~ video and ~~data as well as~~ control data, ~~, so as to form a ring network,~~ such that the audio, video, and control data are transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length, in which certain bit positions are provided respectively for the audio, video, and control data, and the bit positions for the audio or video data respectively are collected together in several connected component bit groups, and the data assigned to these component bit groups are assigned by ~~means of~~ transmitted control signals to a certain data source or data sink, at least one data source being present for audio and video data and at least one data sink being present for the audio and video data transmitted over the data line ~~(1)~~, wherein the at least one data source comprises: ~~characterized in that the subscribers include a data source for compressed audio and video data, the data source comprising~~

~~- a demultiplexer (4) to separate the compressed audio and compressed video data which are contained in one compressed signal,~~

~~- a bit stream decoder (11) to decode the compressed audio data, and an audio buffer (8) for the intermediate storage of the separated audio data,~~

~~- a bit rate converter (10) to recode the compressed video data and a video buffer (7) for the intermediate storage of the separated video data,~~

~~- a bus interface (2), which inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and~~

~~- a control unit (6), which is connected to the audio buffer (8) and the video buffer~~

~~(7), and which specifies and controls the adjustable intermediate storage time of the buffers (7, 8).~~

a data source for compressed audio and video data including,

a demultiplexer to separate the compressed audio and compressed video data contained in one compressed signal,

a bit stream decoder to decode the compressed audio data,

an audio buffer for intermediately storing the separated audio data,

a bit rate converter to recode the compressed video data,

a video buffer for intermediately storing the separated video data,

a bus interface that inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and

a control unit that is connected to the audio buffer and the video buffer, and which specifies and controls the adjustable intermediate storage time of the buffers.

2. The local network of ~~Claim~~ claim 1, wherein

~~characterized in that~~

-the data source for compressed audio and video data is a data source for other compressed data, wherein the demultiplexer separates the ~~and these~~ other compressed data ~~are conducted to the demultiplexer (4) for separating them~~ from the audio data and the video data, and wherein the data source further comprises

~~and that~~ a second bit rate converter ~~(12) is present~~ for recoding the other, compressed data, and

~~that~~ a data buffer ~~(9) is present~~ for the intermediate storage of the separated other data, and wherein

~~-that the~~ bus interface ~~(2) is apt to~~ is configured to insert the delayed, decoded audio data, the delayed, recoded video data, and the delayed, recoded other data ~~from the data source~~ into their intended component bit groups.~~, and~~

~~-a control unit is present, which is connected to the audio buffer (8), the video buffer (7), and the data buffer (9), and which specifies and controls the adjustable intermediate storage time of the buffers (7, 8, 9).~~

3. The local network of ~~Claim~~ claim 1 ~~or 2~~, ~~characterized in that~~ wherein the at least one of the buffers ~~(7, 8, 9)~~ is situated before the bus interface ~~(2)~~.

4. The local network of ~~one of~~ claim 2, ~~the preceding claims, characterized in that~~ wherein the at least one buffer ~~(7, 8, 9)~~ is operationally interposed between ~~situated immediately behind~~ the demultiplexer ~~(4) in front of~~ and the bit stream decoder ~~(11)~~ or bit rate converter ~~(10, 12)~~ associated with it.

5. The local network ~~of one~~ of ~~the preceding claims~~claim 12, ~~characterized in that~~ wherein analytical units ~~(5)~~ are associated with the bit stream decoder ~~(11)~~ and the bit rate converters ~~(10, 12)~~, which determine the time relation of the compressed video data with respect to the compressed audio data~~one another~~, and which are connected to the control unit ~~(6)~~ to specify the intermediate storage times.

6. The local network of ~~one of the preceding claims~~ claim 12, wherein ~~characterized in~~

~~that~~ the control unit controls ~~(6) is connected to~~ the bit stream decoder ~~(11)~~ and ~~to~~ the bit rate converter~~(s) (10, 12)~~, ~~and that these can be controlled via the connecting lines in~~ such ~~a way~~ that the time differences due to different processing times in the data source can be reduced in the displayed signals.

7. The local network ~~of one~~ of claim 1, wherein the data line is ~~the preceding claims, characterized in that the subscribers of the network are connected by~~ an optical data line ~~(1)~~.

8. The local network of ~~one of the preceding claims~~claim 12, ~~characterized in that~~ wherein the bit rate converter ~~(10)~~ for the compressed video data is connected to the control unit ~~(6)~~, and can be controlled over this connecting line in such a way that the extent of data reduction during the bit rate conversion and thus the processing time needed for this can be adjusted in dependence on the resolution and/or the size of the display in the associated data sink for video data.

9. The local network of ~~one of the preceding claims~~claim 2, ~~characterized in that~~ wherein the bit stream decoder ~~(11)~~ converts the compressed audio signal into a PCM audio signal.

10. The local network of ~~one of the preceding~~ claim 1s, ~~characterized in that~~ wherein the data source ~~contains~~ comprises a DVD player ~~(13)~~.

11. The local network of ~~one of the preceding claims~~claim 1, ~~characterized in that~~ wherein at least one data sink for the data transmitted from the data source via the data line ~~(1)~~ ~~contains~~ comprises a buffer for the intermediate storage of the received data, whose

intermediate storage time can be adjusted as a function of a control signal transmitted from the data source via the data line ~~(1)~~.

--12. The local network of claim 2, wherein the data source further comprises:

a control unit, connected to the audio buffer, the video buffer, and the other data buffer, that specifies and controls the adjustable intermediate storage time of the buffers.--

--13. A vehicle-hosted local network comprising a subscriber data source that transmits in parallel audio data and compressed video data to respective subscriber data sinks on the network.--

--14. The vehicle-hosted local network of claim 13, wherein the subscriber data source comprises:

a device that generates a compressed source signal including compressed audio data and compressed video data; and

a pre-processing circuit configured to parallel process the compressed audio data and the compressed video data.--

--15. The vehicle-hosted local network of claim 13, wherein the pre-processing circuit comprises:

a demultiplexer that separates the compressed audio data and the compressed video data contained in the compressed source signal;

an audio data processing path that decodes the compressed audio data into an uncompressed format and generates decoded audio data in response to control instructions;

a video data processing path that recodes the compressed video data to reduce the quantity of video data, and generates recoded video data in response to control instructions; and

a bus interface that combines the decoded audio data and the recoded video data into component picture groups for parallel transmission over the local network to their respective data sinks.--

--16. The vehicle-hosted local network of claim 15, wherein the audio data processing path comprises:

a bit stream decoder for decoding the separated compressed audio data, converting the audio data into an uncompressed format; and

an audio buffer for storing the separated audio data for an intermediate time determined by the control instruction.--

--17. The vehicle-hosted local network of claim 15, wherein the video data processing path comprises:

a bit rate converter for recoding the compressed video data to reduce the quantity of video data; and

a video buffer for storing the separated video data for a time determined by the control instruction.--

--18. The vehicle-hosted local network of claim 13, wherein the subscriber data source comprises:

a device that generates a compressed source signal including compressed audio data

and compressed video data; and

a pre-processing circuit configured to separately process the compressed audio data and the compressed video data to generate uncompressed audio data and a reduced quantity compressed video data, wherein time differences in the separate processing of correlated audio data and video data is minimized.--

--19. A method for pre-processing a compressed signal generated by equipment for transmitting audio and video data over a local network implemented in a vehicle, the method comprising the steps of:

a) separating compressed audio and compressed video data contained in the compressed signal; and

b) parallel processing the compressed audio data and the compressed video data such that time differences in the reproduction of correlated audio data and video data are minimized.--

--20. The method of claim 19, wherein said step of parallel processing comprises the steps of:

decoding the compressed audio data into an uncompressed format;

recoding the compressed video data to reduce the quantity of video data; and

combining the decoded audio data and the recoded video data into component picture groups for parallel transmission over the local network to their respective data sinks.--

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A Local Network in a Vehicle

The invention relates to a local network for a vehicle with several subscribers distributed over the vehicle, which are connected to one another by means of a data line to transmit audio and video data as well as control data, so as to form a ring network.

Such a local network for a vehicle is known from the German Patent Specification DE 195 03 213 C1. This local network has several subscribers, some of which generate audio data, video data, and control data, and feed these into the ring network. These subscribers are called data sources. Other subscribers of the network take the data intended for them from the network and cause them to be displayed, which may be an acoustic reproduction or a visual reproduction. These subscribers are so-called data sinks. The local network described here has various data sources, for example a car radio, CD player, video recorder, or also a TV tuner, which conduct their data uncompressed to appropriate data sinks via an optical data line. The data sinks can be, for example, an audio amplifier to which several loudspeakers are connected, or a screen which displays the uncompressed BAS video signal. Using a TV tuner as an example of a data source, the video data are transmitted to a screen, in the manner described above, as uncompressed FBAS video signals; in parallel to this, the audio data are transmitted to an audio amplifier via the network, as uncompressed audio data, and are reproduced as acoustic signals. The data are here transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length. In these bit groups, specific bit positions for transmission from the data source to the data sink are prescribed for the audio and video data, that is real-time-relevant source data,

which are not accessible to an interruption of the data flow, as well as for the control data. The bit positions for the source data are collected together in several connected partial picture groups, by means of which the specific audio and video data of a data source are transmitted in parallel to an associated data sink. This transmission is organized by means of control data that are transmitted in parallel. The subscribers to such a network can input their data into the network or take their data from it independently of one another and sometimes simultaneously. Such a network can accommodate only a few subscribers, since the transmission capacity of the network over the data line is limited.

It is the object of the invention to create a local network which, on the one hand, better utilizes the maximum transmission capacity with a view to possibly increasing the number of subscribers, but on the other hand maintains as much as possible the quality of data display in the data sinks.

This object is achieved by the invention by a local network with the characteristics of Claim 1.

Advantageous developments are found in the subclaims.

The inventive local network has a data source for compressed audio and video data, which has a demultiplexer to separate the compressed audio and compressed video data contained in a compressed signal. These compressed audio and video data are processed separately from one another. The compressed audio data are then conducted to a bit stream decoder for decoding. The bit stream decoder converts the audio data into an uncompressed format, especially a PCM format. An audio buffer for the intermediate storage of the

separated audio data is associated with the bit stream decoder. The intermediate storage time of this audio buffer can be varied by appropriate control instructions. The compressed video data, separated off by the demultiplexer, are conducted for recoding to a bit rate converter, which accomplishes a data reduction of the video data. The scope of this reduction is here guided especially in accordance with the resolution and size of the display in the data sink. In this way, it becomes possible that the extent of the transmitted compressed video data is markedly reduced. Since the extent of reduction is matched to the requirements of the data sink, the display quality of the video data is not affected thereby. A video buffer, whose intermediate storage time can be adjusted by a control instruction, is associated with this bit rate converter.

The intermediately stored, decoded audio data and the intermediately stored, recoded video data are conducted to a bus interface, which brings the data into the component picture [sic, should be "bit", also ff] groups provided for transmission to the data sink, and thus makes possible parallel transmission to conduct these data over the data line to their respective data sink. The intermediate storage time of the buffers is here controlled by a control unit in the data source in such a way that time differences in the display of the correlated audio data and video data at least are reduced but preferably are completely eliminated. Such time differences can occur, for example, due to a different length of time required for processing in the bit stream decoder and in the bit rate converter. It is thus assured that the correct sound for a picture is transmitted and displayed at the correct time. It thus becomes possible to improve the quality of the transmitted data from the data source for both the audio and video data in a mutually coordinated manner.

The specific design of the transmission of the data-reduced, compressed video data and the uncompressed audio data over the date line additionally achieves

an advantageous compromise between the requirements of economy of the local network and its optimized transmission capacity. According to the invention, the audio data are transmitted in an uncompressed form, thus providing an economical design for the data sink for audio data; however, in view of the very extensive quantities of video data, even in spite of data reduction, compressed transmission is chosen, and thus the data sink for video data must be equipped with a correspondingly expensive decoder module. However, in view of the improved utilization of the data transmission capacity, this is compensated by the transmission of the compressed, reduced video signal.

There are data sources which, in addition to the compressed audio data and video data, also receive other compressed data or take such data from a data medium, such as for example a DVD player. Such a DVD player (digital versatile disc player) can read, in its playback unit, the compressed signals stored on a DVD disc, and by means of a demultiplexer can divide these data into the components of compressed audio data, compressed video data, and compressed other data, and can conduct these to specific, separate further processing units. In the manner described, the compressed audio data and the compressed video data are put into intermediate storage and are decoded or recoded respectively, while the other compressed data are conducted to a second bit rate converter for recoding, and furthermore these data are conducted along the data path to a data buffer for intermediate storage of these separated data. After the various types of data have been separately processed, they are all conducted to a bus interface, which inserts the various data into appropriate, separate component picture groups for transmission, via the data line, to their respective data sink. The data buffer is controlled by the control unit in correspondence with the audio buffer and to the video buffer, and the variable intermediate storage time is thus specified. By suitably specifying

the intermediate storage time of the respective buffers, the time differences in the display of the data, which have resulted for the compressed audio, video, and other data along their path from the antenna or from the storage medium or from a feed line from the data source are at least partly compensated. Typical examples of other compressed data are information regarding the so-called subpictures, as these are known from DVD. Through this triple division of the compressed signals, it is assured that all the various data are delayed in their time progress specifically and differently, for example in accordance with the respective processing time, so that the audio data, video data, and other data are displayed as simultaneously as possible, for example as subpictures in the individual data sinks.

It has proven advantageous to situate the buffers directly before the interface, that is after the bit rate converter or decoder. This assures that all time differences generated before the intermediate storage, especially the time differences formed in the decoder and the bit rate converters are at least partly compensated before the data are inserted into the component picture groups through the bus interface. This control is designed as a type of forward control, resulting in a very simple, secure, and economical controlled structure.

In addition, it is also possible to situate the buffers directly behind the demultiplexer and before the respectively associated bit stream decoder or bit rate converter. This assures that the various data can be transmitted completely or largely time-corrected already while the compressed data are further processed in the bit rate converter or the audio decoder. This design proves to be especially advantageous if the control unit controls not only the buffers but also the bit rate converters and the audio decoder in such a way that

these are enabled to perform a possibly needed slight compensation of3 existing time differences. Such a compensation can be effected, for example in the case of data from a DVD player, by means of the so-called time stamps associated with the data.

According to a preferred design of the invention, analytical units are situated in the paths for processing the audio data, the video data, and the other data. By means of these, the respective present relative delays resulting from the different processing or modification of the data in their individual paths is observed and, interacting with the control unit, the delay times in the individual buffers or in the bit rate converters or the bit stream decoders are set in accordance with the presently observed conditions. This makes it possible to react specifically to the most various situations. For example, if no sound or only a stationary picture or only simple numeric characters are being transmitted, the data quantities to be processed and transmitted change, so that different processing times for one and the same data type can occur. These changes are taken into account through the present design of the invention.

It has proven especially advantageous to design the network with an optical data line. With this design, the maximum data quantity that can be transmitted by the network is nearly independent of the theoretically maximum transmission capacity of the data line, since this capacity typically cannot be exhausted by a local network for an automotive application. Consequently, the limited data transmission capacity of the data line need not be taken into account.

The bit rate converter for the compressed video data preferably is connected to the control unit, and can be controlled in such a way that the scope of data reduction during the bit rate conversion can be adjusted in dependence on the data quantity that can be displayed by the data sink.

As the scope of data reduction varies, the processing time needed for this in the bit rate converter also varies, so that, depending on the resolution and/or the size of the display in the data sink and thus depending on the display capabilities of the display, the required delay time of the individual data types is chosen accordingly, by the inventive design. The transmission of the relevant information about the display in the data sink to the control unit via the ring data line enables the control unit to control the bit rate converter for the video data and/or the corresponding delay elements in such a way that the various data are displayed without significant time discrepancy.

According to an especially preferred design of the invention, at least one data sink for the data transmitted from the data source via the data line is equipped with a buffer for intermediate storage of the received data. The intermediate storage time of this buffer depends on a control signal that is transmitted from the data source via the data line. Thus, the time progress of the data can be corrected not only in the data source but also in the data sink. In this way, it is possible to correct systematic delays for data associated with a particular data sink by means of a buffer situated in this data sink. A correction in the data source or in another data sink is thus not necessary. Accordingly, systematic differences in the data sources can be corrected by such a buffer in the respective data sink.

A preferred embodiment of the inventive data source is shown in Figure 1 and will be explained in more detail below.

The local network has a plurality of subscribers which are connected in a ring over an optical data line 1. Each subscriber has a bus interface 2 with two connections to the optical data line 1. The subscriber shown in Figure 1 represents a data source, which has a DVD drive 3 and which prepares the compressed audio, video, and other data stored on a DVD disc and feeds these, through the interface 2, into the data line 1, for transmission to the data sinks that are associated with this data source. The compressed audio, video, and other data, which have been read out from the DVD drive 3, and which are present as a compressed signal, are separated out of the common compressed signal in a demultiplexer 4, and each of them is conducted to a specific processing path.

The compressed video data, separated off by the demultiplexer 4, are conducted to an analytical unit 5 for video data as a multiple video packet-sized elementary stream. This unit analyzes the extent and type of compressed video data to be processed, and conducts the result of this analysis to the control unit 6. The analyzed, compressed video data, are not changed by the analytical unit 5, and subsequently are conducted to a bit rate converter 10, which recodes the compressed video data from the DVD disc. These data follow the MPEG-2 video standard and have variable bit rates up to 10 megabit/s. During the recoding, a data reduction occurs, which is guided in accordance with the properties of the data sink and in particular according to the size and resolution of the display in the data sink. The information regarding the size and resolution is conducted to the control unit 6 via the data line 1, the bus interface 2, and the control line 13, and are converted into appropriate control instructions to control the bit rate converter 10. Since the MPEG-2 video data are designed for display on a large high-resolution screen, and since such high-resolution large screens find no application in a vehicle, the data reduction described above can discard the majority of the compressed data

as much as three-quarters, and only the rest will be transmitted. This does not noticeably affect the display of the video data in the data sink. The recoded, data-reduced, compressed video data are then conducted to the video buffer 7 as packet-sized elementary streams. Under the control of the control unit 6, this buffer can change the intermediate storage time and thus the delay time. The delayed video data are then conducted to a bus interface 2, which writes the video data into appropriate component picture [sic] groups, for transmission to a corresponding data sink.

Besides the compressed video data, the compressed audio data are conducted to a corresponding audio data path, which is constructed separately from the video data path. The compressed audio data, like the video data, are conducted to an analytical unit 5, which investigates the extent and type of the audio data, and conducts the result to the control unit 6. Then the unchanged, compressed audio data, which are present in a DVD disk, for example in accordance with the Dolby digital compression process, are decoded by a bit stream decoder 11. This decoder 11 is constructed as a Dolby digital decoder 11, and converts the compressed audio signals into uncompressed PCM signals, which make possible Surround Sound (5 + 1 channels). The uncompressed audio data are then conducted to an audio buffer 8, which is connected to the control unit 5 and which can be controlled by this unit in such a way that the intermediate storage time and thus the delay time can be changed.

In corresponding fashion, the compressed, other data, separated by the demultiplexer 4, are assigned to a data path, which correspondingly has an analytical unit 5, another bit rate converter 12, and a data buffer 9. These components of the data path have the

corresponding functionalities as the components of the other paths.

From the three analytical units 5, the control unit 6 obtains information regarding the expected relative time delays resulting from the different processing times in the individual data paths. By means of this information, the respective delay times of the individual buffers 7, 8, 9 are chosen. Also, the bit rate converter 10 for the compressed video data and the Dolby digital decoder 11 for the compressed audio data, as well as the other bit rate converter 12 for the compressed other data are driven by the control unit 6 in such a way that their processing occurs slightly later or earlier. A time correction is also performed here by means of the time stamps contained in the compressed data. The time stamps themselves can here also be read out from the bit stream, can be changed, and can again be inserted into the bit stream for a subsequent correction.

This inventive separation of the various data and their specific processing, including the specific delay times dependent thereon, more closely harmonize the mutually correlated data. These are then transmitted via the bus interface 2 to the data line 1, and to the respective data sinks, that is other subscribers of the network, which are accommodated separately from the data source at another place in the vehicle. The inventive design with the correction of the time differences due to the different processing times of the various data types succeeds in displaying the correlated data largely or completely synchronously. This assures that a tone reproduced by a sound system matches a picture reproduced on a display in the motor vehicle. This raises the level of the visual and acoustic reproduction quality of the local network with its subscribers. Furthermore,

the transmission capacity of the network is used very efficiently, since, depending on the data type, compressed, data-reduced transmission forms and uncompressed data forms are transmitted simultaneously.

List of Reference Symbols

1	Data line
2	Bus interface
3	DVD drive
4	Demultiplexer
5	Analytical unit
6	Control unit
7	Video buffer
8	Audio buffer
9	Data buffer
10	Bit rate converter
11	Dolby digital decoder
12	Second bit rate converter
13	Control line

Claims

1. A local network in a vehicle with several subscribers distributed over the vehicle, which form data sources and data sinks and which are connected with one another by means of a data line (1) to transmit audio and video data as well as control data, so as to form a ring network, such that the audio, video, and control data are transmitted in a format which prescribes a clocked sequence of individual bit groups of the same length, in which certain bit positions are provided respectively for the audio, video, and control data, and the bit positions for the audio or video data respectively are collected together in several connected component bit groups, and the data assigned to these component bit groups are assigned by means of transmitted control signals to a certain data source or data sink, at least one data source being present for audio and video data and at least one data sink being present for the audio and video data transmitted over the data line (1), characterized in that the subscribers include a data source for compressed audio and video data , the data source comprising

   - a demultiplexer (4) to separate the compressed audio and compressed video data which are contained in one compressed signal,

- a bit stream decoder (11) to decode the compressed audio data, and an audio buffer (8) for the intermediate storage of the separated audio data,
- a bit rate converter (10) to recode the compressed video data and a video buffer (7) for the intermediate storage of the separated video data,
- a bus interface (2), which inserts the delayed, decoded audio data and the delayed, recoded video data from the data source into their intended component bit groups, and
- a control unit (6), which is connected to the audio buffer (8) and the video buffer (7), and which specifies and controls the adjustable intermediate storage time of the buffers (7, 8).

2. The local network of Claim 1,

characterized in that

-the data source for compressed audio and video data is a data source for other compressed data, and these other compressed data are conducted to the demultiplexer (4) for separating them from the audio and video data, and that a second bit rate converter (12) is present for recoding the other, compressed data, and that a data buffer (9) is present for the intermediate storage of the separated data,

-the bus interface (2) is apt to insert the delayed, decoded audio data, the delayed, recoded video data, and the delayed, recoded data from the data source into their intended component bit groups, and

-a control unit (6) is present, which is connected to the audio buffer (8), the video buffer (7), and the data buffer (9), and which specifies and controls the adjustable intermediate storage time of the buffers (7, 8, 9).

3. The local network of Claim 1 or 2, characterized in that at least one of the buffers (7, 8, 9) is situated before the interface (2).

4. The local network of one of the preceding claims, characterized in that at least one of the buffer (7, 8, 9) is situated immediately behind the demultiplexer (4) in front of the bit stream decoder (11) or bit rate converter (10, 12) associated with it.

5. The local network of one of the preceding claims, characterized in that analytical units (5) are associated with the bit stream decoder (11) and the bit rate converters (10, 12), which determine the time relation of the data with respect to one another, and which are connected to the control unit (6) to specify the intermediate storage times.

6. The local network of one of the preceding claims, characterized in that the control unit (6) is connected to the bit stream decoder (11) and to the bit rate converter(s) (10, 12), and that these can be controlled via the connecting lines in such a way that the time differences due to different processing times in the data source can be reduced in the displayed signals.

7. The local network of one of the preceding claims, characterized in that the subscribers of the network are connected by an optical data line (1).

8. The local network of one of the preceding claims, characterized in that the bit rate converter (10) for the compressed video data is connected to the control unit (6), and can be controlled over this connecting line in such a way that the extent of data reduction during the bit rate conversion and thus the processing time needed for this can be adjusted in dependence on the resolution and/or the size of the display in the associated data sink for video data.

9. The local network of one of the preceding claims, characterized in that the bit stream decoder (11) converts the compressed audio signal into a PCM audio signal.

10. The local network of one of the preceding claims, characterized in that the data source contains a DVD player (3).

11. The local network of one of the preceding claims, characterized in that at least one data sink for the data transmitted from the data source via the data line (1) contains a buffer for the intermediate storage of the received data, whose intermediate storage time can be adjusted as a function of a control signal transmitted from the data source via the data line (1).

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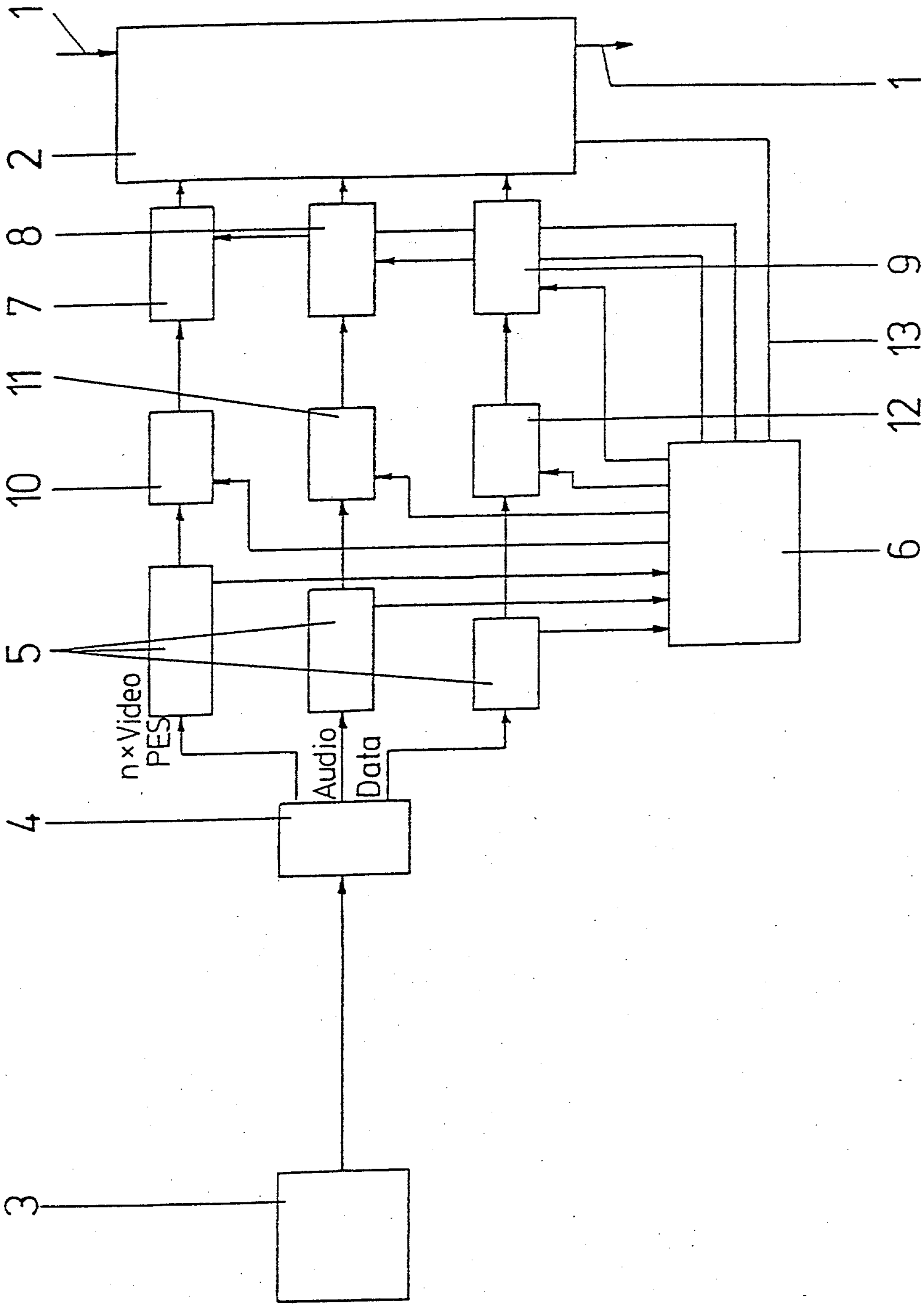

FIG 1

XSY002US

Docket No: West.6268

DECLARATION AND POWER OF ATTORNEY

I, the below named inventor, hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **LOCAL NETWORK IN A VEHICLE**, the specification which was filed with the United States Patent and Trademark Office on July 27, 2001 as Serial No. 09/890,315.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate filed by me on the same subject matter having a filing date before that of the application on which priority is claimed: German Patent Application No. 199 03 266.1 filed January 28, 1999 and International Patent Application No. PCT/EP00/00419 filed January 20, 2000.

I hereby declare that all statements are made hereby of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint:

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all of the firm of Samuels, Gauthier & Stevens, my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

I request that all correspondence be directed to:

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